Response To Office Action Mailed March 26, 2003

A. Pending Claims

Claims 1-32 are currently pending. Claims 4, 5, 8-10, 12, 13, 20, 21, 24-26, 28, and 29 have been amended. The claims have been amended for clarification and/or correction of typographical errors.

B. Submission of Priority Document

Applicant submits herewith a certified copy of Korean Patent Application No. 005411/1999.

C. The Claims Are Not Anticipated By Menon Pursuant To 35 U.S.C. § 102(b),

The Examiner rejected claims 1-2, 4-7, 9-18, and 20-32 under 35 U.S.C. 102(b) as anticipated by U.S. Patent No. 5,346,872 to Menon et al. (hereinafter "Menon"). Applicant respectfully disagrees with the rejections.

The standard for "anticipation" is one of fairly strict identity. To anticipate a claim of a patent, a single prior source must contain all the claimed essential elements. *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 231 U.S.P.Q.81, 91 (Fed. Cir. 1986); *In re Donahue*, 766 F.2d 531,226 U.S.P.Q. 619,621 (Fed. Cir. 1985).

The Examiner states:

> Menon, et al. teach an ethylene catalyst (col. 9, l. 34-36) having a magnesium dihydroxycarbyloxide (prepared from reacting Mg with an alcohol) (col. 3, l. 53-59; col. 5, l. 9 – col. 6, l. 10) followed by a titanium compound (col. 3, l. 59-64; col. 8, l. 1-50) and/or vanadium compound (col. 3, l. 59-64; col. 7, l. 42-68) and/or silica compound. (col. 2, l. 34 – col. 9, l. 40) Halogenated titanium (col. 3, l. 65 – col. 4, l. 2), vanadium compound (col. 4, l. 3-8) are reacted with a

halosilane (col. 4, l. 9-28; col. 6, l. 49-68; col. 8, l. 67 – col. 9, l. 10) and optionally with an aluminum compound, particularly a haloaluminum compound (col. 4, l. 13-15; col. 6, l. 49-68) or alkylaluminum compound (col. 8, l. 57-66).

Claim 1 describes a combination of features including:

wherein said catalyst is produced by the method comprising:

(i) preparing a magnesium solution by contact-reacting a halogenated magnesium compound with alcohol;

(ii) reacting said solution with an ester compound having at least one hydroxy group, or a phosphorus compound and a silicon compound having alkoxy groups, and then producing a solid component by adding a mixture of a titanium compound and a silicon compound thereto; and

(iii) reacting said solid component with an aluminum compound, and then reacting the same with a titanium compound, or a titanium compound and a vanadium compound.

Claim 17 describes a combination of features including:

preparing a magnesium solution by contact-reacting a halogenated magnesium compound with alcohol;

reacting said solution with an ester compound having at least one hydroxy group, or a phosphorus compound and a silicon compound having alkoxy groups, and then producing a solid component by adding a mixture of a titanium compound and a silicon compound thereto; and

reacting said solid component with an aluminum compound, and then reacting the same with a titanium compound, or a titanium compound and a vanadium compound.

Menon appears to teach a polymerization catalyst produced on a porous, inorganic support. For example, Menon states:

The preferred solid catalyst component utilized in the present catalyst system is prepared by initially contacting a porous, inorganic oxide support, such as silica, with at least one hydrocarbon soluble magnesium compound or a magnesium aluminum complex and at least one modifying compound.

A preferred support is silica that has a high surface area and high pore volume. (Menon, column 4, lines 34-41)

In a preferred embodiment, the surface-modified silica is then contacted

> with at least one hydrocarbon soluble magnesium-containing compound or a magnesium aluminum complex. (Menon, column 5, lines 9-12)

Applicant teaches the reaction of a magnesium compound with an alcohol. The resulting compound is then reacted with an ester compound having at least one hydroxyl group or a phosphorous compound and a silicon compound having alkoxy groups. Applicant submits that this feature is not taught or suggested by Menon.

Menon also states:

> In addition to the silica being contacted by at least one hydrocarbon soluble magnesium-containing compound or magnesium aluminum complex, the silica containing the magnesium may also contact a modifying compound selected from the group consisting of silicon halides, having the structural formula SiX^4_4, boron halides having the structural formula BX^5_3, aluminum halides having the structural formula AlX^6_3, where X^4, X^5, and X^6 are the same or different and are halogen, and mixtures thereof. (Menon, column 6, lines 49-58)

Menon teaches adding silicon compounds, boron compounds, or aluminum compounds or mixtures to an inorganic support that has been reacted with magnesium. Applicant teaches reacting a magnesium support, which differs from Menon as explained above, with a mixture of a titanium compound and a silicon compound. Applicant submits that this feature is not taught or suggested by Menon.

Menon further states:

> The solid product containing the soluble hydrocarbon magnesium containing compound or magnesium aluminum complex is then reacted simultaneously or in successive steps of no particular order with a titanium-containing compound and a vanadium containing compound. (Menon, column 7, lines 36-41)

Menon teaches reacting the obtained solid product with a titanium compound and a vanadium compound. Applicant teaches reacting the solid compound, described above, with an aluminum

compound and then reacting the product with a titanium compound or a titanium compound and a vanadium compound. Applicant submits that this feature is not taught or suggested by Menon.

The catalysts of Menon and Applicant appear to be produced by different methods resulting in different products. Applicant's claims are directed to a combination of features including the features of "preparing a magnesium solution by contact-reacting a halogenated magnesium compound with alcohol; reacting said solution with an ester compound having at least one hydroxy group, or a phosphorus compound and a silicon compound having alkoxy groups, and then producing a solid component by adding a mixture of a titanium compound and a silicon compound thereto; and reacting said solid component with an aluminum compound, and then reacting the same with a titanium compound, or a titanium compound and a vanadium compound." Applicant submits that at least these features, in combination with other features of the claims, are not taught or suggested by Menon. Applicant respectfully requests removal of the rejections of claims 1 and 17 and the claims dependent thereon.

D. <u>The Claims Are Not Anticipated By Klimek Pursuant To 35 U.S.C. § 102(b),</u>

The Examiner rejected claims 1-7 and 9-32 under 35 U.S.C. 102(b) as anticipated by U.S. Patent No. 5,587,436 to Klimek et al. (hereinafter "Klimek"). Applicant respectfully disagrees with the rejections.

The Examiner states:

> Klimek, et al. teach an ethylene catalyst (col. 3, l. 14-16) having a magnesium dihydroxycarbyloxide (prepared from reacting Mg with an alcohol) (col. 5, l 36-44) followed by a titanium compound (col. 5, l. 17-35; col. 6, l. 17-42; col. 6, l. 43 – col. 7, l. 2; Example in col. 10) and/or vanadium compound (col. 7, l. 45 – col. 8, l. 27) and/or silica compound, particularly a silica halide or hydrocarbyloxide silica (col. 7, l. 3-44; col. 8, l. 31-37) with an organophosphorus complex (col. 5, l. 9 = col. 17; example; col. 14, l. 10 – col. 18, l. 16). Electron donors like triphenylphosphine oxide are cited (col. 5, l. 45-57). Organoaluminum cocatalyst like alkylaluminum halide is cited (col. 5, l. 58 – col. 6, l. 2). Activators and or modifiers are cited like boron halides (col. 6, l.

3-16).

Claim 1 describes a combination of features including:

wherein said catalyst is produced by the method comprising:
(i) preparing a magnesium solution by contact-reacting a halogenated magnesium compound with alcohol;
(ii) reacting said solution with an ester compound having at least one hydroxy group, or a phosphorus compound and a silicon compound having alkoxy groups, and then producing a solid component by adding a mixture of a titanium compound and a silicon compound thereto; and
(iii) reacting said solid component with an aluminum compound, and then reacting the same with a titanium compound, or a titanium compound and a vanadium compound.

Claim 17 describes a combination of features including:

preparing a magnesium solution by contact-reacting a halogenated magnesium compound with alcohol;

reacting said solution with an ester compound having at least one hydroxy group, or a phosphorus compound and a silicon compound having alkoxy groups, and then producing a solid component by adding a mixture of a titanium compound and a silicon compound thereto; and

reacting said solid component with an aluminum compound, and then reacting the same with a titanium compound, or a titanium compound and a vanadium compound.

Klimek appears to teach a Ti/Al catalyst system for the polymerization of ethylene and propylene. For example, Klimek states:

To effect polymerization of propylene and ethylene, a high activity Ziegler-Natta catalyst comprised of a titanium-containing catalyst component and organoaluminum cocatalyst component is necessarily employed. Such catalysts are known and are referred to herein as Ti/Al catalysts. These may include additional components, such as a support, modifying compound(s), magnesium and other metal compound(s), electron donating compounds(s), and the like. (Klimek, column 5, lines 9-16)

Klimek provides various embodiments of producing a catalyst. For example, Klimek states:

> One preferred supported catalyst of the above type useful for the preparation of the propylene-ethylene copolymers in accordance with the invention, referred to as embodiment I, is obtained by : (a) treating silica to remove surface hydroxyl groups...(b) contacting said treated silica with (1) a modifying compound selected from the group consisting of silicon halides, boron halides, aluminum halides, alkyl silicon halides and mixtures thereof; and (2) at least one hydrocarbon soluble magnesium-containing compound...(c) contacting said product of step (b) with at least one titanium-containing compound having the structural formula $Ti(OR)_nX_m$, where R is aryl, alkyl or mixtures thereof; X is halogen; n is an integer of 1 to 4; m is 0 or an integer of 1 to 3; and the sum of m and n is 4; and (d) treating the product of step (c) with a titanium-containing compound having the structural formula $TiX^1_p(OR^1)_q$, where X^1 is halogen; R^1 is aryl or alkyl; p is an integer 1 to 4; q is 0 or an integer of 1 to 3; and the sum of p and q is 4, with the proviso that the titanium-containing compound of this step is not the same as the titanium-containing compound of step (c). (Klimek, column 6, lines 43-67)

Klimek appears to teach contacting silica with a silicon compound, a boron compound, an aluminum compound, or a mixture thereof with a magnesium compound followed by contacting with a first titanium compound and then by a second and different titanium compound. Klimek does not appear to teach or suggest the step of reacting a magnesium compound with an ester compound having at least one hydroxyl group or reacting a magnesium compound with a phosphorous compound and a silicon compound having alkoxy groups. Klimek also does not appear to teach or suggest the steps of adding a mixture of a titanium compound and a silicon compound to the product from the reaction of a magnesium compound with an ester or a combination of a phosphourous compond and a silicon compound. Furthermore, Klimek does not appear to teach or suggest reacting the resulting solid product with aluminum.

Klimek teaches another embodiment of the catalyst as:

> In another preferred embodiment (embodiment II), the catalyst is obtained by treating silica to remove surface hydroxyl groups...reacting said modified silica support having a selective distribution of reactive hydroxyl groups with a magnesium compound reactive with said surface hydroxyl groups, optionally reacting the thus obtained product with a silicon halide, alkyl silicon halide, boron halide or aluminum halide, further reacting the so-produced first material with a tetra-substituted organo halogen-free titanium compound wherein the

> organic moiety sterically hinders accessibility of said organo titanium compound to the reactive sites on the modified silica support and thereafter reacting the so-produced second material with a titanium halide. (Klimek, column 7, lines 3-17)

Klimek appears to teach contacting silica with a silicon compound, a boron compound, an aluminum compound, or a mixture thereof with a magnesium compound followed by contacting with a first titanium compound and then by a second and different titanium compound. Klimek does not appear to teach or suggest the step of reacting a magnesium compound with an ester compound having at least one hydroxyl group or reacting a magnesium compound with a phosphorous compound and a silicon compound having alkoxy groups. Klimek also does not appear to teach or suggest the steps of adding a mixture of a titanium compound and a silicon compound to the product from the reaction of a magnesium compound with an ester or a combination of a phosphourous compond and a silicon compound. Furthermore, Klimek does not appear to teach or suggest reacting the resulting solid product with aluminum.

Klimek teaches a further embodiment of the catalyst as:

> For yet another preferred embodiment (embodiment III), the catalyst is prepared by (a) contacting silica, in random order, with (1) at least one hydrocarbon soluble magnesium-containing compound; and (2) a first modifying compound selected from the group consisting of silicon halide; boron halides, aluminum halides and mixtures thereof followed by a second modifying compound selected from the group consisting of a silane of the formula $SiH_rX^2_s$, where X^2 is halogen; r is an integer of 1 to 3; and s is an integer of 1 to 3, with the proviso that the sum of r and s is 4, hydrogen halides having the structural formula HX^3, where X^3 is halogen, and mixtures thereof, said sequence of contact of silica with said components (1) and (2) being random; (b) contacting the product of step (a) with a first titanium-containing compound having the structural formula $Ti(OR)_mX_n$, where R is hydrocarbyl or cresyl; X is halogen; m is an integer of 1 to 4; and n is 0 or an integer of 1 to 3, with the proviso that the sum of m and n is 4; and (c) contacting the product of step (b) with a second titanium-containing compound having the structural formula $TiX^1_p(OR^1)_q$, where X^1 is halogen; R^1 is hydrocarbyl; p is an integer of 1 to 4; q is 0 or an integer of 1 to 3, with the provisos that the sum of p and q is 4 and that said first titanium-containing compound and said second titanium-containing compound are different. (Klimek, column 7, lines 19-43)

Klimek appears to teach contacting silica with a silicon compound, a boron compound, an

aluminum compound, or a mixture thereof with a magnesium compound followed by contacting with a first titanium compound and then by a second and different titanium compound. Klimek does not appear to teach or suggest the step of reacting a magnesium compound with an ester compound having at least one hydroxyl group or reacting a magnesium compound with a phosphorous compound and a silicon compound having alkoxy groups. Klimek also does not appear to teach or suggest the steps of adding a mixture of a titanium compound and a silicon compound to the product from the reaction of a magnesium compound with an ester or a combination of a phosphourous compond and a silicon compound. Furthermore, Klimek does not appear to teach or suggest reacting the resulting solid product with aluminum.

Klimek teaches another embodiment of the catalyst as:

> For another preferred embodiment (embodiment IV), a highly useful catalyst is produced by (a) treating an inert inorganic support with hexamethyl disilazane to remove surface hydroxyl group...; (b) contacting said treated inert inorganic support with a hydrocarbon soluble magnesium compound; (c) contacting said product of said step (b) with a modifying compound selected form the group consisting of silicon halides, boron halides, aluminum halides, hexaalkyl disilazanes and mixtures thereof; (d) contacting said product of said step (c) with a vanadium compound having the structural formula $V(O)_2X^1_{4-s}$, where X^1 is halogen; and s is 0 or 1; a first titanium-containing compound having the structural formula $TiX^3_p(OR^3)$ where X^3 is halogen; R^3 is hydrocarbyl; p is an integer of 1 to 4; and q is 0 or an integer of 1 to 3, with the proviso that the sum of p and q are 4 and, optionally a second titanium-containing compound of the formula $Ti(OR^2)_nX_m$, where R^2 is hydrocarbyl; X^2 is halogen; n is an integer of 1 to 4; and m is 0 or an integer of 1 to 3 with the proviso that the sum of n and m is 4; and with the further proviso that if two titanium-containing compounds are used said first and said second titanium-containing compounds are not identical. (Klimek, column 7, lines 45-67)

Klimek appears to teach contacting silica with a silicon compound, a boron compound, an aluminum compound, or a mixture thereof with a magnesium compound followed by contacting with a first titanium compound and then by a second and different titanium compound. Klimek does not appear to teach or suggest the step of reacting a magnesium compound with an ester compound having at least one hydroxyl group or reacting a magnesium compound with a phosphorous compound and a silicon compound having alkoxy groups. Klimek also does not

appear to teach or suggest the steps of adding a mixture of a titanium compound and a silicon compound to the product from the reaction of a magnesium compound with an ester or a combination of a phosphourous compond and a silicon compound. Furthermore, Klimek does not appear to teach or suggest reacting the resulting solid product with aluminum.

Klimek teaches a final embodiment of the catalyst as:

> A final preferred embodiment (embodiment V) utilizes a catalyst component obtained by (a) heating an inert inorganic support...(b)contacting the treated inert inorganic compound with a hydrocarbon soluble magnesium compound; (c) contacting the product of said step (b) with a modifying compound selected from the group consisting of silicon halides, boron halides, aluminum halides, alkyl silicon halides, hexaalkyl disilazanes and mixtures thereof; and (d) contacting the product of said step (c) with a vanadium compound having the structural formula $V(O_2)X^1_{4-s}$, is halogen and s is 0 or 1; a first titanium-containing compound having the structural formula $TiX^3_p(OR^3)_q$, where X^3 is halogen, R^3 is hydrocarbyl, p is an integer of 1 to 4, and q is 0 or an integer of 1 to 3, with the proviso that the sum of p and q are 4 and, optionally, a second titanium-containing compound of the formula $Ti(OR^2)_nX^2_m$, where R^2 is hydrocarbyl, X^2 is halogen, n is an integer of 1 to 4, and m is 0 or an integer of 1 to 3 with the proviso that the sum of n and m is 4; and with the further proviso that if two titanium-containing compounds are used said first and said second titanium-containing compounds are not identical. (Klimek, column 8, lines 3-25)

Klimek appears to teach contacting silica with a silicon compound, a boron compound, an aluminum compound, or a mixture thereof with a magnesium compound followed by contacting with a first titanium compound and then by a second and different titanium compound. Klimek does not appear to teach or suggest the step of reacting a magnesium compound with an ester compound having at least one hydroxyl group or reacting a magnesium compound with a phosphorous compound and a silicon compound having alkoxy groups. Klimek also does not appear to teach or suggest the steps of adding a mixture of a titanium compound and a silicon compound to the product from the reaction of a magnesium compound with an ester or a combination of a phosphourous compond and a silicon compound. Furthermore, Klimek does not appear to teach or suggest reacting the resulting solid product with aluminum.

The catalysts of Klimek and Applicant appear to be produced by different methods resulting in different products. Applicant's claims are directed to a combination of features including the features of "preparing a magnesium solution by contact-reacting a halogenated magnesium compound with alcohol; reacting said solution with an ester compound having at least one hydroxy group, or a phosphorus compound and a silicon compound having alkoxy groups, and then producing a solid component by adding a mixture of a titanium compound and a silicon compound thereto; and reacting said solid component with an aluminum compound, and then reacting the same with a titanium compound, or a titanium compound and a vanadium compound." Applicant submits that at least these features, in combination with other features of the claims, are not taught or suggested by Klimek. Applicant respectfully requests removal of the rejections of claims 1 and 17 and the claims dependent thereon.

E. Summary

Based on the above, Applicant submits that all claims are in condition for allowance. Favorable reconsideration is respectfully requested.

A Fee Authorization is enclosed to cover charges for a one-month extension of time. If any additional extension of time is required, Applicant hereby requests the appropriate extension of time. If any additional fees are required, or if fees have been overpaid, please appropriately charge or credit those fees to Meyertons, Hood, Kivlin, Kowert & Goetzel, P.C. Deposit Account Number 50-1505/5333-01300/EBM.

Respectfully submitted,

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